US008195146B2

(12) United States Patent
Prakash et al.

(10) Patent No.: US 8,195,146 B2
(45) Date of Patent: Jun. 5, 2012

(54) **REMOTE MANAGEMENT OVER A WIRELESS WIDE-AREA NETWORK USING SHORT MESSAGE SERVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 186 days.

(21) Appl. No.: **12/645,948**

(22) Filed: **Dec. 23, 2009**

(65) **Prior Publication Data**

US 2011/0151854 A1 Jun. 23, 2011

(51) **Int. Cl.**
H04M 3/00 (2006.01)

(52) **U.S. Cl.** **455/420**; 455/419; 455/557; 455/574; 455/466; 455/426.1

(58) **Field of Classification Search** 455/419, 455/466, 425, 426.1, 456.6, 575, 574; 370/338
See application file for complete search history.

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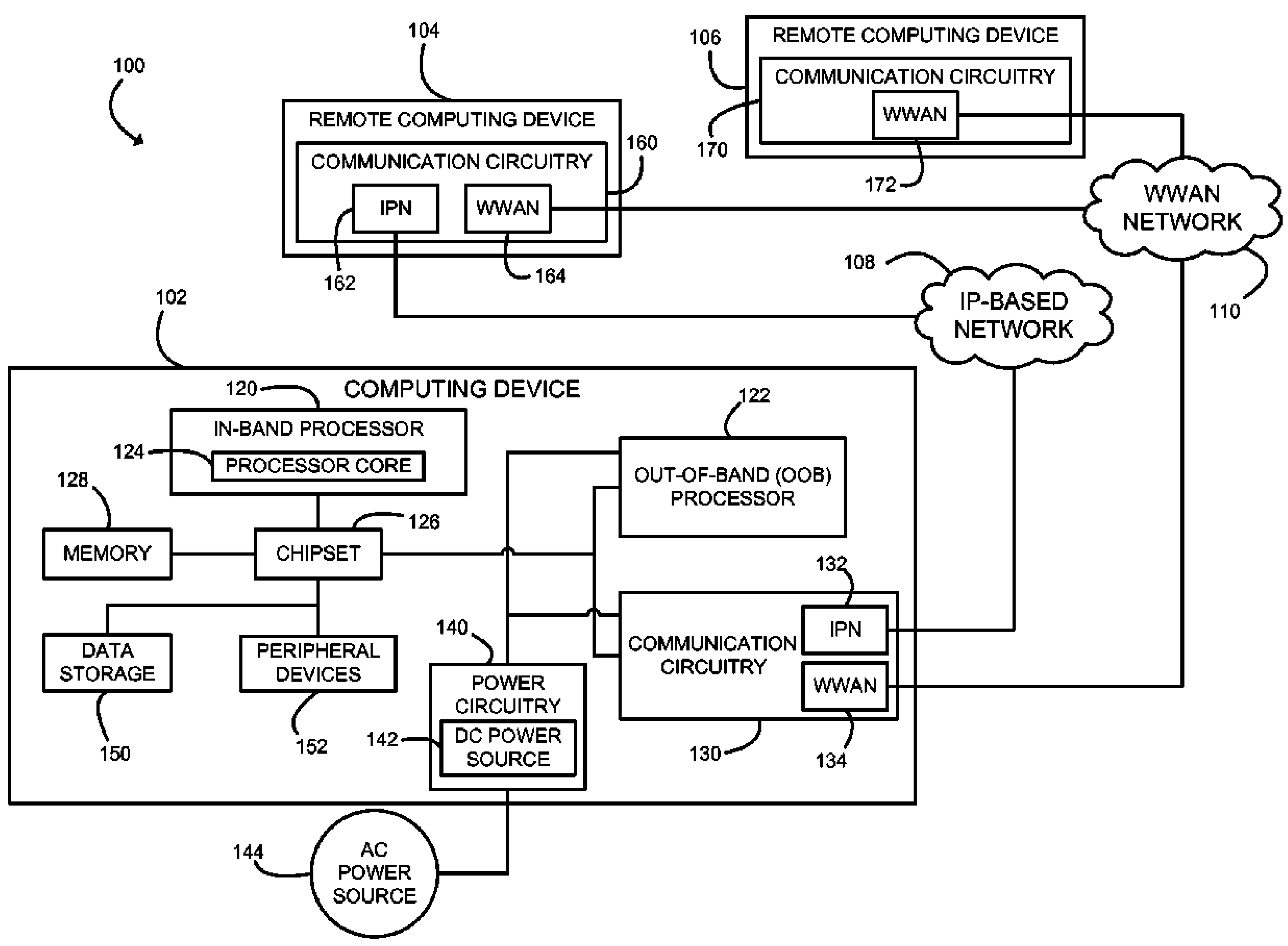
(57) **ABSTRACT**

A method and device for remote management over a wireless wide-area network includes receiving a short message over a wireless wide-area network (WWAN) using an out-of-band (OOB) processor of a computing device. The OOB processor is capable of communicating over the WWAN irrespective of an operational state of an in-band processor of the computing device. The computing device executes at least one operation with the OOB processor in response to receiving the short message.

20 Claims, 3 Drawing Sheets



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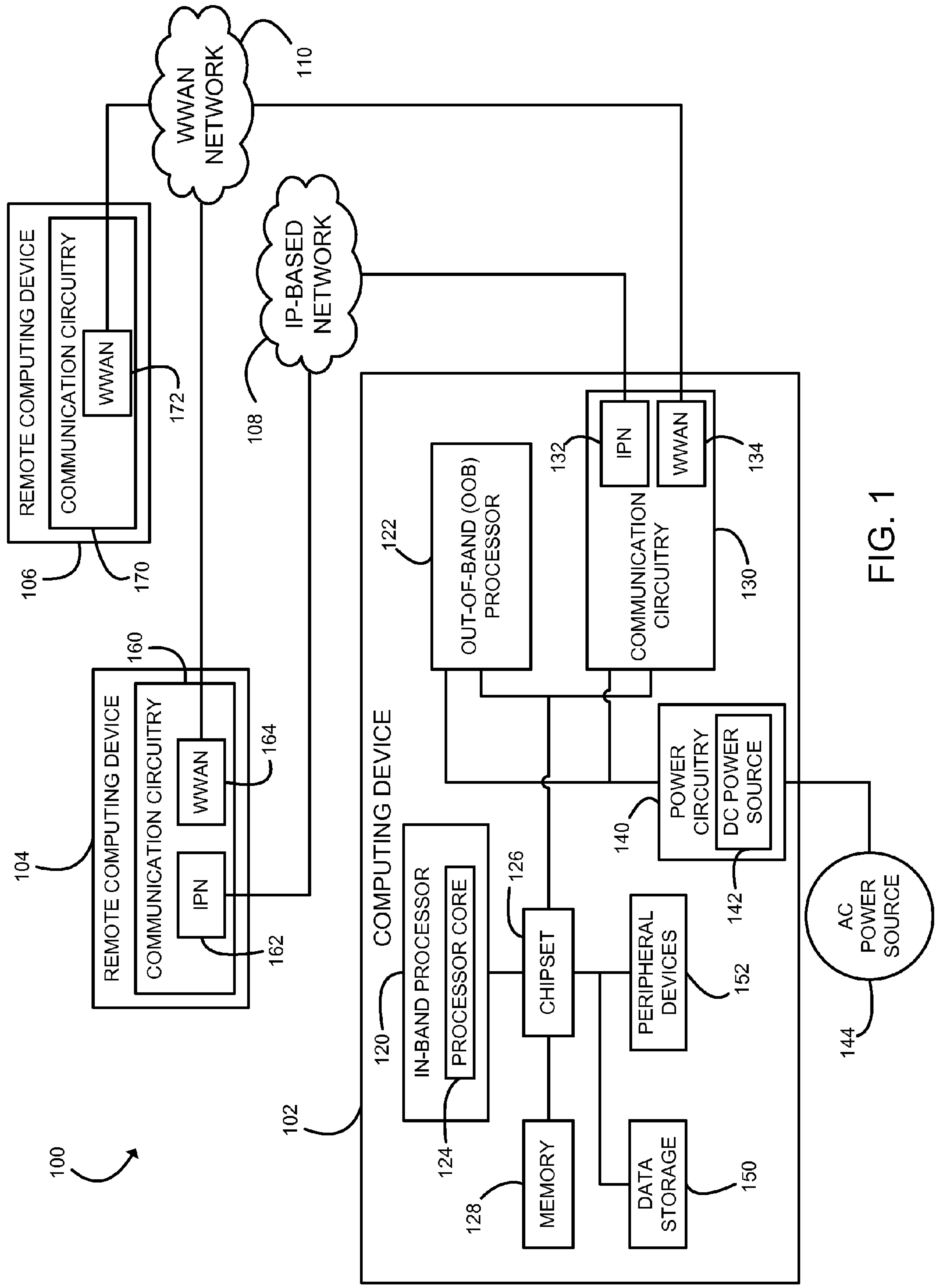

100
102
COMPUTING DEVICE
IN-BAND PROCESSOR
PROCESSOR CORE
120
124
126
CHIPSET
MEMORY
128
DATA STORAGE
150
PERIPHERAL DEVICES
152
OUT-OF-BAND (OOB) PROCESSOR
122
COMMUNICATION CIRCUITRY
130
IPN
132
WWAN
134
POWER CIRCUITRY
140
DC POWER SOURCE
142
AC POWER SOURCE
144
REMOTE COMPUTING DEVICE
104
COMMUNICATION CIRCUITRY
160
IPN
162
WWAN
164
REMOTE COMPUTING DEVICE
106
COMMUNICATION CIRCUITRY
170
WWAN
172
IP-BASED NETWORK
108
WWAN NETWORK
110

FIG. 1

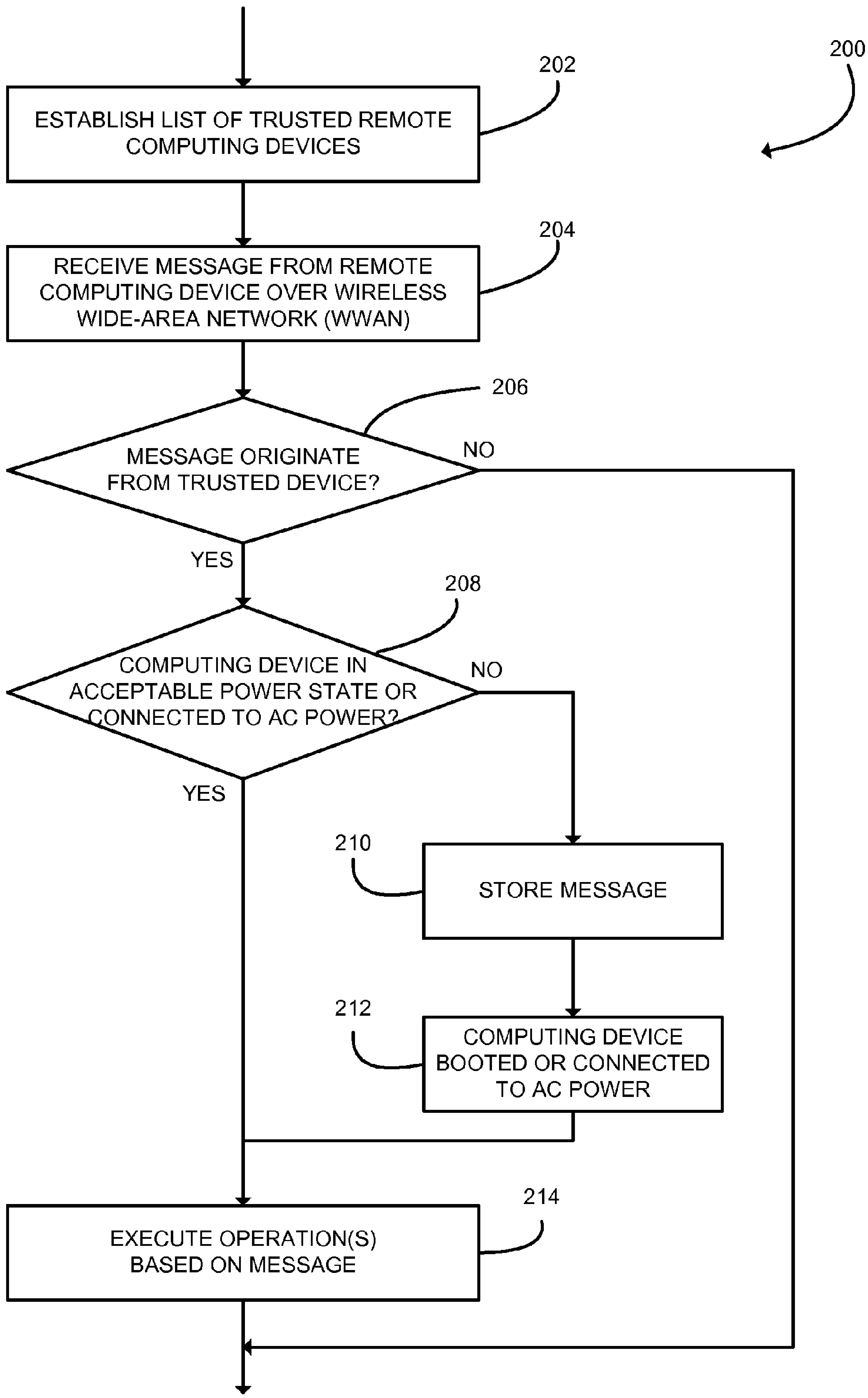
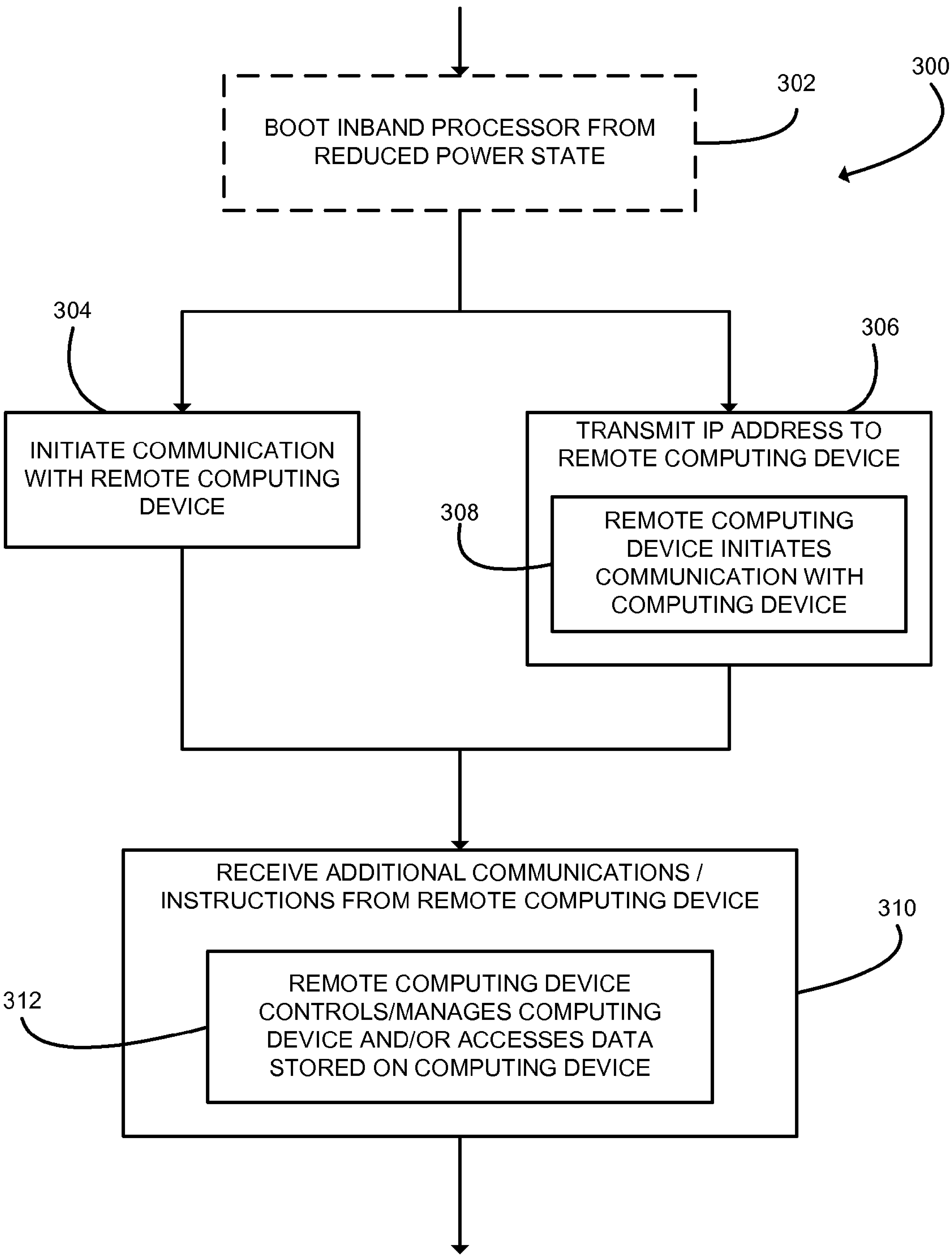

200
202
ESTABLISH LIST OF TRUSTED REMOTE COMPUTING DEVICES
204
RECEIVE MESSAGE FROM REMOTE COMPUTING DEVICE OVER WIRELESS WIDE-AREA NETWORK (WWAN)
206
MESSAGE ORIGINATE FROM TRUSTED DEVICE?
NO
YES
208
COMPUTING DEVICE IN ACCEPTABLE POWER STATE OR CONNECTED TO AC POWER?
NO
YES
210
STORE MESSAGE
212
COMPUTING DEVICE BOOTED OR CONNECTED TO AC POWER
214
EXECUTE OPERATION(S) BASED ON MESSAGE

FIG. 2



300
302
BOOT INBAND PROCESSOR FROM REDUCED POWER STATE
304
INITIATE COMMUNICATION WITH REMOTE COMPUTING DEVICE
306
TRANSMIT IP ADDRESS TO REMOTE COMPUTING DEVICE
308
REMOTE COMPUTING DEVICE INITIATES COMMUNICATION WITH COMPUTING DEVICE
310
RECEIVE ADDITIONAL COMMUNICATIONS / INSTRUCTIONS FROM REMOTE COMPUTING DEVICE
312
REMOTE COMPUTING DEVICE CONTROLS/MANAGES COMPUTING DEVICE AND/OR ACCESSES DATA STORED ON COMPUTING DEVICE

FIG. 3

REMOTE MANAGEMENT OVER A WIRELESS WIDE-AREA NETWORK USING SHORT MESSAGE SERVICE

BACKGROUND

A wide-area network (WAN) is a communications network which covers a relatively large geographic area, as compared to a local-area network (LAN). A wireless wide-area network (WWAN) typically employs a cellular radio network to provide wireless communications, possibly on a citywide or even nationwide basis. One illustrative embodiment of a WWAN is a telecommunications network configured according to the GSM (Groupe Spécial Mobile) standard. The GSM standard uses digital channels for both speech and data and, thus, has been referred to as a second generation (2 G) mobile telephony system. Third generation (3 G) and fourth generation (4 G) versions of GSM networks allow simultaneous use of speech and data services and higher data rates than 2 G networks. One feature of the GSM standard is the Subscriber Identity Module (SIM), commonly known as a SIM card. A SIM is a detachable smart card that stores an International Mobile Equipment Identity (IMEI) that uniquely identifies the phone or computing device on the GSM network.

Although optimized for telephony, the GSM standard introduced Short Message Service (SMS), or "text messaging," as an alternate mode of communication between devices on the WWAN. The SMS protocol allows for a "short message" consisting of 140 bytes of data, plus headers and routing information, to be sent over the GSM network. Longer "short messages" may be sent by concatenating several messages together. SMS is realized in modern WWANs by use of the Mobile Application Part (MAP) of the SS7 protocol. A Short Message Service Center (SMSC) is a network element in the WWAN that receives, stores, and forwards (delivers) short messages between user devices on the network.

BRIEF DESCRIPTION OF THE DRAWINGS

The systems, devices, and methods described herein are illustrated by way of example, and not by way of limitation, in the accompanying figures. For simplicity and clarity of illustration, elements illustrated in the figures are not necessarily drawn to scale. For example, the dimensions of some elements may be exaggerated relative to other elements for clarity. In the following figures:

FIG. **1** is a simplified block diagram of one embodiment of a system configured to provide remote management over a wireless wide-area network;

FIG. **2** is a simplified flow diagram of one embodiment of a method for providing remote management over a wireless wide-area network used by the system of FIG. **1**; and

FIG. **3** is a simplified flow diagram of one embodiment of a method for executing one or more operations based on a short message received during the method of FIG. **2**.

DETAILED DESCRIPTION OF THE DRAWINGS

While the concepts of the present disclosure are susceptible to various modifications and alternative forms, specific exemplary embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the concepts of the present disclosure to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

In the following description, numerous specific details such as logic implementations, opcodes, means to specify operands, resource partitioning/sharing/duplication implementations, types and interrelationships of system components, and logic partitioning/integration choices may be set forth in order to provide a more thorough understanding of the present disclosure. It will be appreciated, however, by one skilled in the art that embodiments of the disclosure may be practiced without such specific details. In other instances, control structures, gate level circuits, and full software instruction sequences may have not been shown in detail in order not to obscure the disclosure. Those of ordinary skill in the art, with the included descriptions, will be able to implement appropriate functionality without undue experimentation.

References in the specification to "one embodiment", "an embodiment", "an example embodiment", etc., indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to effect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described.

Some embodiments of the disclosure may be implemented in hardware, firmware, software, or any combination thereof. Embodiments of the disclosure implemented in a computer system may include one or more bus-based interconnects between components and/or one or more point-to-point interconnects between components. Embodiments of the invention may also be implemented as instructions stored on a machine-readable, tangible medium, which may be read and executed by one or more processors. A machine-readable, tangible medium may include any tangible mechanism for storing or transmitting information in a form readable by a machine (e.g., a computing device). For example, a machine-readable, tangible medium may include read only memory (ROM); random access memory (RAM); magnetic disk storage media; optical storage media; flash memory devices; and other tangible mediums.

Referring now to FIG. **1**, a system **100** configured to provide remote management over a wireless wide-area network (WWAN) using short messages includes a computing device **102**, a remote computing device **104**, and a WWAN **110** that communicatively couples the computing device **102** to the remote computing device **104**. In some embodiments, the system **100** may include an Internet Protocol (IP) based network (IPN) **108** that also communicatively couples the computing device **102** to the remote computing device **104**. In other embodiments, the system **100** may further include another remote computing device **106** connected, via the WWAN **110**, to the computing device **102**. Additional remote computing devices (not shown) may communicate with the computing device **102** over either or both of the IPN **108** and the WWAN **110**.

The computing device **102** may be embodied as any type of electronic device capable of performing the functions described herein. For example, the computing device **102** may be embodied as a personal computer, a workstation, a laptop computer, a handheld computer, a mobile internet device, a cellular phone, a personal data assistant, a telephony device, a network appliance, a virtualization device, a storage controller, or other computer-based device.

The computing device **102** includes an in-band processor **120**, an out-of-band (OOB) processor **122**, a chipset **126**, a memory **128**, communication circuitry **130**, and power circuitry **140**. In some embodiments, the computing device **102** may also include one or more data storage devices **150** and/or one or more additional peripheral devices **152**. In some illustrative embodiments, several of the foregoing components may be incorporated on a motherboard of the computing device **102**, while other components may be communicatively coupled to the motherboard via, for example, a peripheral port. Furthermore, it should be appreciated that the computing device **102** may include other components, sub-components, and devices commonly found in a computer and/or computing device, which are not illustrated in FIG. **1** for clarity of the description.

The in-band processor **120** of the computing device **102** may be any type of processor capable of executing software/firmware, such as a microprocessor, digital signal processor, microcontroller, or the like. The in-band processor **120** is illustratively embodied as a single core processor having a processor core **124**. However, in other embodiments, the in-band processor **120** may be embodied as a multi-core processor having multiple processor cores **124**. Additionally, the computing device **102** may include additional in-band processors **120** having one or more processor cores **124**. The in-band processor **120** is generally responsible for executing a software stack, which may include an operating system and various applications, programs, libraries, and drivers resident on the computing device **102**.

The chipset **126** of the computing device **102** may include a memory controller hub (MCH or "northbridge"), an input/output controller hub (ICH or "southbridge"), and a firmware device. In such embodiments, the firmware device may be embodied as a memory storage device for storing Basic Input/Output System (BIOS) data and/or instructions and/or other information. However, in other embodiments, chipsets having other configurations may be used. For example, in some embodiments, the chipset **126** may be embodied as a platform controller hub (PCH). In such embodiments, the memory controller hub (MCH) may be incorporated in or otherwise associated with the in-band processor **120**.

The chipset **126** is communicatively coupled to the in-band processor **120** via a number of signal paths. These signal paths (and other signal paths illustrated in FIG. **1**) may be embodied as any type of signal paths capable of facilitating communication between the components of the computing device **102**. For example, the signal paths may be embodied as any number of wires, cables, light guides, printed circuit board traces, via, bus, intervening devices, and/or the like.

The memory **128** of the computing device **102** is also communicatively coupled to the chipset **126** via a number of signal paths. The memory **128** may be embodied as one or more memory devices or data storage locations including, for example, dynamic random access memory devices (DRAM), synchronous dynamic random access memory devices (SDRAM), double-data rate synchronous dynamic random access memory device (DDR SDRAM), flash memory devices, and/or other volatile memory devices. Additionally, although only a single memory device **128** is illustrated in FIG. **1**, in other embodiments, the computing device **102** may include additional memory devices. The operating system, applications, programs, libraries, and drivers that make up the software stack executed by the in-band processor **120** may reside in memory **128** during execution. Furthermore, software and data stored in memory **128** may be swapped between memory **128** and one or more data storage devices **150** as part of memory management operations.

The communication circuitry **130** of the computing device **102** may be embodied as any number of devices and circuitry for enabling communications between the computing device **102** and one or more remote devices (such as remote computing devices **104**, **106**) over the IPN **108** and/or the WWAN **110**. For example, communication circuitry **130** includes a wireless network interface **134** for facilitating communications over the WWAN **110**. The wireless network interface **134** may be illustratively embodied as a GSM, 3 G, or 4 G modem having a wireless transceiver. In such embodiments, the wireless modem **134** will include a SIM card (not shown) with an International Mobile Equipment Identity (IMEI) that uniquely identifies the computing device **102** on the WWAN **110**. Among other types of communications, the wireless modem **134** allows the computing device **102** to send and receive short messages according to an SMS protocol over the WWAN **110**. In some embodiments, the communication circuitry **130** may also include one or more wired or wireless network interfaces **132** to facilitate IP-based wired and/or wireless communications over the IPN **108**. Communication circuitry **130** is also communicatively coupled to the chipset **126** via a number of signal paths, allowing the in-band processor **120** to access the networks **108**, **110**.

The components of computing device **102**, including in-band processor **120**, chipset **126**, memory **128**, and communication circuitry **130**, are also operably coupled to power circuitry **140**. The power circuitry **140** may be embodied as a circuit capable of drawing power from an AC commercial power source **144**, a DC battery power source **142**, or both. To conserve energy, the computing device **102** may be placed in several reduced-power operational states when not being actively used. For example, the computing device **102** may be placed in a powered down or "off" state in which few, if any, components of the computing device **102** receive power from the power circuitry **140**. Alternatively, the computing device **102** may be placed into various "sleep" or "hibernate" states in which some, but not all, components of computing device **102** receive power from the power circuitry **140**. For instance, a "sleep" state may provide power to a volatile memory **128** (in order to retain data) but not to the in-band processor **120**. Such a reduced-power operational state conserves energy while allowing the computing device **102** to return quickly to a full-power operational state.

The out-of-band (OOB) processor **122** is distinct from and generally operates independently of the in-band processor **120**. The OOB processor **122** may also be embodied as any type of processor capable of executing software, such as a microprocessor, digital signal processor, microcontroller, or the like, including one or more processors having one or more processor cores (not shown). The OOB processor **122** may be integrated into the chipset **126** on the motherboard or may be embodied as one or more separate integrated circuits disposed on an expansion board that is communicatively coupled to the chipset **126** via a number of signal paths. The OOB processor **122** may also be communicatively coupled to various components of the computing device **102**, such as the memory **128** and the communication circuitry **130**, via a number of signal paths. Alternatively or additionally, the OOB processor **122** may include built-in components with similar functionality, such as a dedicated memory and/or dedicated communication circuitry (not shown).

The OOB processor **122** is configured for managing particular functions of the computing device **102** irrespective of the operational state of the in-band processor **120**. To facilitate such independent operation, the OOB processor **122** may be provided with an independent connection to the power circuitry **140**, allowing the OOB processor **122** to retain power even when other components of the computing device **102** are powered down or turned off. Furthermore, the OOB processor **122** may be provided with one or more independent network interfaces via communication circuitry **130**, which is also provided with an independent connection to the power circuitry **140**, allowing out-of-band communications over the IPN **108** and/or the WWAN **110**. In other words, the OOB processor **122** is able to communicate directly with devices on the networks **108**, **110** (such as remote computing devices **104**, **106**), outside of the operating system running on in-band processor **120**. In fact, this communication may take place without the user's knowledge. The OOB processor **122** is also capable of causing the computing device **102** to return to a full-power operational state, including booting the operating system. In summary, the OOB processor **122** may operate intelligently based on incoming queries/commands and communicate across the networks **108**, **110** whether the in-band processor **120** is turned off, running on standby, being initialized, or in regular operation and whether the operating system is booting, running, crashed, or otherwise.

In some illustrative embodiments, the OOB processor **122** may be implemented using Intel® Active Management Technology (Intel® AMT), using a portion of Intel® AMT, or using an Intel® Management Engine (Intel® ME), all available from Intel Corporation of Santa Clara, Calif., and/or within chipsets sold by Intel Corporation. Intel AMT® embedded platform technology enables out-of-band access to hardware and software information stored in non-volatile memory on each endpoint device, eliminating the need for a functioning operating system and many of the software agents found in other management tools.

As discussed above, the computing device **102** may also include one or more data storage devices **150** and one or more peripheral devices **152**. In such embodiments, the chipset **126** is also communicatively coupled to the one or more data storage devices **150** and the one or more peripheral devices **152** via a number of signal paths. The data storage device(s) **150** may be embodied as any type of device configured for the short-term or long-term storage of data such as, for example, memory devices and circuits, memory cards, hard disk drives, solid-state drives, or other data storage devices. The peripheral device(s) **152** may include any number of peripheral devices including input devices, output devices, and other interface devices. For example, the peripheral devices **152** may include a display, a mouse, a keyboard, and/or one or more external speakers of the computing device **102**. The particular devices included in the peripheral devices **152** may depend upon, for example, the intended use of the computing device.

The IPN **108** is embodied as, or otherwise include, any number of wired and/or wireless IP-based communications networks such as IP-based local area networks (LAN), IP-based wide area networks (WAN), and/or publicly available global networks (e.g., the Internet). Additionally, the IPN **108** may include any number of additional devices to facilitate communication between the computing device **102** and the remote computing device **104**, such as routers, switches, intervening computers, and the like.

As described above, the WWAN **110** is a wireless wide-area network that covers a relatively large geographic area and uses mobile telecommunication cellular network technologies to communicate data. For example, in some embodiments, WWAN **110** may be a cellular radio network configured according to the GSM (Groupe Special Mobile), 3 G, or 4 G standard. In such embodiments, the WWAN **110** includes a Short Message Service Center (not shown) which is configured to receive, store, and forward (deliver) short messages between computing device **102** and remote computing devices **104**, **106**. Additionally, the WWAN **110** may include any number of additional devices to facilitate communication between the computing device **102** and the remote computing devices **104**, **106**, such as routers, switches, intervening computers, and the like

The remote computing devices **104**, **106** may be embodied as any type of computing devices separate from the computing device **102**. For example, the remote computing devices **104**, **106** may be embodied as one or more personal computers, workstations, laptop computers, handheld computers, mobile internet devices, cellular phones, personal data assistants, telephony devices, network appliances, virtualization devices, storage controllers, or other computer-based devices also configured to communicate with the computing device **102** over the networks **108**, **110**. The remote computing devices **104**, **106** may each have a similar configuration to that of the computing device **102**, including communication circuitry **160**, **170**. Some remote computing devices **104** may have communication circuitry **160** that includes both an IPN interface **162** and a WWAN interface **164**, while other remote computing devices **106** may have communication circuitry **170** that includes only a WWAN interface **172**.

Several of the features of OOB processor **122**, including its persistent power circuitry **140** and independent communication channel, allow the system **100** to provide remote management over the WWAN **110** using short messages. To do so, as illustrated in FIG. **2**, the computing device **102** may be configured to execute a method **200** for providing remote management over the WWAN **110**. The method **200** may be executed by, for example, the OOB processor **122**, in conjunction with other components of the computing device **102**, which may interact with other components of the system **100**. The method **200** may allow remote management of the computing device **102** for any purpose, including, but not limited to, operating system management, software patches, antivirus updates, secure file/folder access, platform feature access, asset management, and/or anti-theft protection.

The method **200** begins with block **202** in which the computing device **102** establishes a list of trusted remote computing devices. The OOB processor **122** will not execute the operations requested by a short message unless the originating device is on the list of trusted devices. This requirement of a preexisting trust relationship prevents the inadvertent execution of malicious software by the OOB processor **122** due to a short message received from a non-trusted party. For the following description, the remote computing device **104** will illustratively be considered a "trusted" device, while the remote computing device **106** will illustratively be considered a "non-trusted" device.

In block **202**, the computing device **102** places the trusted remote computing device **104** on its list of trusted devices. The trust relationship may be established in several ways. In some embodiments (where at least one device is portable), the computing devices **102**, **104** could be brought within four centimeters of one another to communicate via near field communication (NFC) to establish a trust relationship. In other embodiments, a centralized server, such as an AMT/Anti-Theft Server could provision a shared secret protocol (symmetry key) between the computing devices **102**, **104** during service activations for added security. In still other embodiments, the user of computing device **102** may register a trusted remote computing device **104**, such as his smart phone, to have remote management capabilities. Many other possibilities for establishing the trust relationship exist and will be apparent to persons of ordinary skill in the art. In each case, the list of trusted devices stored on the computing device **102** will have identification data, which may be used to identify uniquely the source of a short message, such as the trusted parties' International Mobile Equipment Identities (IMEI).

In block **204**, OOB processor **122** receives a short message over the WWAN **110**. This short message may originate from one of the remote computing devices **104**, **106** and is directed to the computing device **102** by a SMS Center on the WWAN **110** (using the phone number, or other unique ID, assigned to the computing device **102**). It should be noted that the short message may be sent to the OOB processor **122** via the WWAN **110** even if the remote computing device does not know an internet protocol (IP) address of the computing device **102**. In other words, a short message may be sent directly to the computing device **102** even from outside a security measure, such as a firewall, hiding the IP address of computing device **102** from the remote computing devices **104**, **106**. It should also be appreciated that the OOB processor **122**, due to its persistent power circuitry **140** and "always-on" communication channel to WWAN **110** through wireless network interface **134**, is available to receive a short message even when the in-band processor **120** of the computing device **102** is in a reduced power state or turned off.

After the short message is received in block **204**, the OOB processor **122** determines if the message originated from a trusted device in block **206**. Each short message that is received by the OOB processor **122** includes sender information embedded in associated routing information, which is typically included in a header of the short message. The OOB processor **122** may verify the sender information against the list of trusted remote computing devices established in block **202**. If the short message did not originate from a trusted device, the OOB processor **122** will not attempt to execute any instructions contained in the message (i.e., blocks **208**-**214** are skipped). Rather, the OOB processor **122** may delete, store, or forward the short message, as appropriate.

However, if the short message is determined to have originated from a trusted device, the method **200** proceeds to block **208** in which the OOB processor **122** determines the current operational state of the computing device **102**. In particular, the OOB processor **122** will evaluate whether the in-band processor **120** is in a full-power operational state or whether the power circuitry **140** is connected to an AC commercial power source **144**. If either of these conditions is satisfied, the OOB processor **122** will execute, in block **214**, one or more operations based on or otherwise indicated by the received short message as discussed in more detail below in regard to FIG. **3**.

However, if the in-band processor **120** is in a reduced-power operational state and the computing device **102** is operating solely on the DC battery power source **142**, the method **200** will proceed to block **210** in which the short message is stored in memory, rather than immediately executed by the OOB processor **122**. In this way, inadvertent draining of any remaining power in the DC battery power source **142** is prevented. That is, if the user has placed the in-band processor in a reduced-power operational state (such as "off" or "hibernate") and the AC commercial power source **144** is unavailable, the computing device **102** will not immediately perform the operation indicated by the short message so as not to drain the remaining power of the device **102**. As such, the remaining power of the DC battery power source **142** is saved for the continued operation of the OOB processor **122** and wireless network interface **134**. The execution of the method **200** holds in block **210** until the computing device **102** is either booted from its reduced-power operational state by the user or the computing device **102** is connected to an AC commercial power source **144**, as indicated in block **212**. Once one of the conditions of block **212** is satisfied, the method **200** proceeds to block **214**.

Once the computing device **102** is connected to the AC commercial power source **144** or booted to a full-power operation state, the method **200** proceeds to block **214** in which the OOB processor **122** executes one or more operations based on or otherwise indicated by the content of the short message received from the trusted remote computing device **104**. The short message may include the direct instructions, functions, or procedures to be executed by the computing device **102** or may include other data from which the computing device **102** determines one or more instructions, functions, or procedures to be executed (e.g., based on a look-up table). As such, the instructions for the OOB processor **122** contained in the short message may be encoded using any suitable methodology within the size limits of the short message (e.g., 140 bytes of data per short message). The short message may instruct the OOB processor **122** to perform one or multiple operations including, for example, booting the in-band processor **120** from a reduced-power operational state, installing a software patch or anti-virus update, or blocking all network ports until a threat is addressed. Of course, in other embodiments, the short message may instruct the OOB processor **122** to perform other operations based on the particular implementation.

Referring now to FIG. **3**, the OOB processor **122** may execute a method **300** for performing one or more operations in block **214** of the method **200**. The method **300** illustrates an embodiment of operations that may be performed by the OOB processor **122** wherein the short message is configured to establish a secure connection between the computing device **102** and the remote computing device **104**. Such a secure connection could be used for file/folder access, feature access, remote diagnosis, and troubleshooting of the computing device **102** by the remote computing device **104**, among other possible uses. For example, in one particular embodiment, the secure connection is established between the computing device **102** and the remote computing device **104** through a firewall, which may be protecting the computing device **102**.

In some embodiments, the method **300** begins with block **302** in which the OOB processor **122** boots the in-band processor **120** from a reduced-power operational state. The short message may instruct the OOB processor **122** to do so in embodiments in which some or all of the remaining operations to be performed require the participation of the in-band processor **120**. Of course, in some situations, the in-band processor **120** may already be in a full-power operational state and does not require booting. In other embodiments, the in-band processor **120** may not be required to perform the operations and, as such, is not booted from a reduced-power operational state.

After the in-band processor **120** has been booted in block **302**, if needed, the method **300** proceeds to either block **304** or block **306**, depending on the content of the received short message. For example, in block **304**, the short message instructs the computing device **102** to initiate a secure communication connection between the device **102** and the remote computing device **104**. To do so, in some embodiments, the OOB processor **122** communicates over the WWAN **110** using wireless network interface **134**. However, in other embodiments, the short message may contain the IP address of the remote computing device **104**. In such embodiments, the OOB processor **122** may initiate communications with the remote computing device **104** over the IPN **108** using network interface **132**. Regardless, however, it should be appreciated that in each embodiment the remote computing device **104** does not need to know the IP address of the computing device **102** in advance.

Alternatively, the short message may instruct the computing device **102** to transmit the IP address of the device **102** in block **306**. If so, the OOB processor **122** transmits the IP address of the computing device **102** to the remote computing device **104** over the WWAN **110** using wireless network interface **134**. In response, the remote computing device **104** may initiate the secure communication connection with the computing device **102** in block **308**. In some embodiments, the OOB processor **122** may receive communications from the remote computing device **104** over the IPN **108** using network interface **132** in block **308**. In other embodiments, the OOB processor **122** may receive communications from the remote computing device **104** over the WWAN **110** using wireless network interface **134** in block **308**.

After a secure connection has been initiated between the computing device **102** and the remote computing device **104** (in block **304** or block **306**), the method **300** proceeds to block **310** in which the OOB processor **122** receives additional communications (and possibly further instructions) from the remote computing device **104** over either the IPN **108** or the WWAN **110**, depending on which method of communication was used to establish the secure connection. As such, in block **312**, the remote computing device **104** may utilize the secure connection to control and/or manage the computing device **102**, as well as data stored on the computing device **102**. The remote computing device **104** may continue to do so until the communication session has ended.

While the disclosure has been illustrated and described in detail in the drawings and foregoing description, such an illustration and description is to be considered as exemplary and not restrictive in character, it being understood that only illustrative embodiments have been shown and described and that all changes and modifications that come within the spirit of the disclosure and the appended claims are desired to be protected.

The invention claimed is:

1. A method comprising:

receiving a short message over a wireless wide-area network (WWAN) using an out-of-band (OOB) processor of a computing device, the OOB processor being capable of communicating over the WWAN irrespective of an operational state of an in-band processor of the computing device;

determining whether the in-band processor is in a full-power operational state and whether the computing device is connected to an external power source in response to receiving the short message; and

executing at least one operation with the OOB processor indicated by the short message in response to determining that the in-band processor is in the full-power operational state or in response to determining that the computing device is connected to the external power source.

2. The method of claim **1**, wherein receiving the short message comprises receiving a short message from a short message service center over a GSM cellular network.

3. The method of claim **1**, wherein receiving the short message comprises receiving a short message that originated from a remote computing device outside of a firewall protecting the computing device having the OOB processor.

4. The method of claim **3**, wherein executing at least one operation with the OOB processor comprises establishing a secure connection, through the firewall, between the remote computing device and the computing device having the OOB processor.

5. The method of claim **3**, further comprising:

establishing a list of trusted remote computing devices; and

executing at least one operation with the OOB processor indicated by the short message only if the remote computing device originating the short message is on the list of trusted remote computing devices.

6. The method of claim **1**, wherein receiving the short message comprises receiving, with the OOB processor, a short message while the in-band processor is in a reduced-power operational state.

7. The method of claim **6**, further comprising storing the short message and delaying execution of the at least one operation with the OOB processor until either the computing device is connected to the external power source or the in-band processor is booted from the reduced-power operational state by a user.

8. The method of claim **6**, wherein executing at least one operation with the OOB processor comprises booting the in-band processor of the computing device from the reduced-power operational state to the full-power operational state.

9. The method of claim **1**, wherein executing at least one operation with the OOB processor comprises initiating communications with a remote computing device.

10. The method of claim **1**, wherein executing at least one operation with the OOB processor comprises transmitting an internet protocol (IP) address of the computing device.

11. A tangible, machine-readable medium comprising a plurality of instructions that, in response to being executed, result in a computing device:

receiving a short message with an out-of-band (OOB) processor of the computing device while an in-band processor of the computing device is in a reduced-power state, the short message being received over a wireless wide-area network (WWAN); and

determining whether the computing device is connected to an external power source in response to receiving the short message; and

executing at least one operation with the OOB processor indicated by the short message in response to determining that the computing device is connected to the external power source or in response to determining that the in-band processor has been booted from the reduced-power operational state by a user.

12. The tangible, machine-readable medium of claim **11**, wherein receiving the short message comprises receiving a short message that originated from a remote computing device outside of a firewall protecting the computing device having the OOB processor.

13. The tangible, machine-readable medium of claim **12**, wherein executing at least one operation with the OOB processor comprises establishing a secure connection, through the firewall, between the remote computing device and the computing device having the OOB processor.

14. The tangible, machine-readable medium of claim **12**, wherein the plurality of instructions, in response to being executed, further result in the computing device:

establishing a list of trusted remote computing devices; and

executing at least one operation with the OOB processor in response to receiving the short message only if the remote computing device originating the short message is on the list of trusted remote computing devices.

15. The tangible, machine-readable medium of claim **11**, wherein the plurality of instructions, in response to being executed, further result in the computing device storing the short message and delaying execution of the at least one operation with the OOB processor until either the computing device is connected to the external power source or the in-band processor is booted from the reduced-power operational state by a user.

16. The tangible, machine-readable medium of claim **11**, wherein executing at least one operation with the OOB processor comprises booting the in-band processor of the computing device from the reduced-power operational state.

17. The tangible, machine-readable medium of claim **16**, wherein executing at least one operation with the OOB processor further comprises initiating communications with a remote computing device.

18. The tangible, machine-readable medium of claim **16**, wherein executing at least one operation with the OOB processor further comprises transmitting an internet protocol (IP) address of the computing device.

19. A computing device comprising:

an in-band processor;

a wireless transceiver configured for communications over a wireless wide-area network (WWAN); and

an out-of-band (OOB) processor capable of communicating over the WWAN using the wireless transceiver irrespective of an operational state of the in-band processor, the OOB processor configured to (i) determine whether the in-band processor is in a full-power operational state and whether the computing device is connected to an external power source in response to receiving a short message via the wireless transceiver and (ii) execute at least one operation indicated by the short message in response to determining that the in-band processor is in the full-power operational state or in response to determining that the computing device is connected to the external power source.

20. The computing device of claim **19**, wherein the OOB processor is configured to boot the in-band processor from a reduced-power operational state to the full-power operational state in response to receiving the short message.

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